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January 13, 1988

Mr. Greg Mollenkoph
U.S. Army Corps of Engineers
Baltimore District
ATTN: NABRE-M
P.O. Box 1715
Baltimore, MD 21203

Dear Greg:

Enclosed for your information are the results of our gypsy moth biological evaluation conducted at the Raystown Lake Project, Army Corps of Engineers. In summary, gypsy moth populations are sufficient to cause heavy defoliation (61-100 percent) in all but the Seven Spring proposed treatment areas. Populations adjacent to Seven Springs, however, might serve as a source from which larval blow-in could occur. Based on the survey data, we concur with your proposal to treat these areas.

In this report, we have presented a list of options and alternatives based on the following management objectives: 1) protecting host tree foliage; 2) preventing tree mortality; and 3) reducing gypsy moth populations. Our recommendations consist of applying B.t. or Dimilin or a combination of both within the treatment areas.

Please feel free to contact Brad or me if you have any questions regarding the survey results or possible management options.

Sincerely,



NOEL F. SCHNEEBERGER
Entomologist
Forest Pest Management

cc: R. Wolfe
Project Manager, Raystown Lake

NFS/BPO/gjh

**Status of Gypsy Moth Populations
at Raystown Lake Project,
Baltimore District
Army Corps of Engineers**

Prepared by

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STATUS OF GYPSY MOTH POPULATIONS AT RAYSTOWN LAKE PROJECT,
BALTIMORE DISTRICT, ARMY CORPS OF ENGINEERS

ABSTRACT

In the spring of 1987, the Army Corps of Engineers in cooperation with the Pennsylvania Department of Environmental Resources treated approximately 1452 acres using Dimilin 25W to suppress gypsy moth populations at the Raystown Lake Project. The treatment succeeded in providing foliage protection, but failed to effectively reduce gypsy moth population densities. Sufficient populations to cause heavy defoliation in 1988 currently reside in 4 of the 5 treatment areas. Several courses of action are discussed in this survey report, and a preferred alternative is identified.

INTRODUCTION

USDA Forest Service, Forest Pest Management, has participated in monitoring gypsy moth populations and evaluating suppression activities at Raystown Lake since 1983. In 1983 and 1984, suppression activities consisted of treating 702 and 726 acres respectively, with a microbial insecticide Bacillus thuringiensis (B.t.). From 1985-1987 suppression activities were conducted on 831, 1130, and 1452 acres respectively, using the insect growth regulator, diflubenzuron. In each year but 1984, wide-spread moderate-heavy defoliation has occurred outside the treatment areas.

On November 16-18, 1987, USDA Forest Service personnel conducted a gypsy moth egg mass survey at Raystown Lake Project, Army Corps of Engineers. The purpose of the survey was to evaluate the efficacy of the 1987 gypsy moth suppression project and to verify the need for suppression activities in 1988. The five areas (1452 acres) treated in 1987 have been proposed for retreatment in 1988.

METHODS

Gypsy moth survey plots were randomly selected based on available host trees (oaks), size of sample areas, uniformity between egg mass counts, areas of concern to facility personnel and available time. At each sample point, either a 1/40th acre fixed-radius plot or a 5-minute walk was conducted.

The fixed-radius plots (radius 18.6 feet) consisted of a tally of all the newly laid (1987) egg masses observed on the overstory trees, understory vegetation, ground litter and duff. The total number of egg masses observed for each plot was then multiplied by 40 to determine the number of egg masses per acre using the following equation:

$$Y = 40X$$

where,

Y = egg masses per acre

X = number of egg masses observed in the plot

The 5-minute walk method consisted of 2 observers casually walking in the same direction from the same starting point within the survey area for a period of 5 minutes. The number of new egg masses observed by both was averaged and the number of egg masses per acre determined as follows:

$$Y = 20.56x + 14.58$$

where,

Y = egg masses per acre

X = average number of egg masses observed
during the 5-minute walk

RESULTS

Table 1 shows the results of the egg mass counts by plot number and survey area. Table 2 summarizes the egg mass data by treatment area, and Table 3 compares pre- and post-treatment egg mass counts for the five areas treated in 1987. Figure 1 shows the survey area and general plot locations. In addition to the established treatment areas, James Creek Recreational Area was also surveyed to determine resident gypsy moth populations.

Seven Points Treatment Area

This area incorporates approximately 577 acres including the recreational area, the road to the recreational area and the administration area. A total of 13 survey points was established within these areas. Egg mass counts ranged from 0-640 and averaged 105 egg masses per acre. This represents an approximate 9 percent increase over the 1986 average of 95 egg masses per acre.

¹Eggen, D.A., and L.P. Abrahamson, 1983. Estimating gypsy moth egg mass densities. State Univ. of NY, Coll. of Env. Sci. and Forestry, School of Forestry. Misc. Publ. No. 1 (ESF 80-002). 30p.

Lake Raystown Resort - Paradise Point Treatment Area

The Lake Raystown Resort and Paradise Point treatment area consists of approximately 580 acres and borders the Rothrock State Forest on Terrace Mountain. A total of 9 survey points was established within this area. Egg mass densities ranged from 0-3200 and averaged 753 egg masses per acre. Compared to pre-treatment levels, gypsy moth populations were reduced by about 14 percent.

James Creek Recreational Area

The James Creek Recreational area is located along the north side of Raystown Lake between the Allegrrippis and Piney Ridges. This area was not treated in 1987 and is not proposed for treatment in 1988. A total of 2 survey plots was established in this area. Egg mass counts averaged 9160 egg masses per acre.

Susquehannock Campground Treatment Area

The Susquehannock treatment area consists of approximately 205 acres within the campground and a 400 foot buffer along the access road leading to the campground. A total of 8 survey points was established in this area. Egg mass densities ranged from 360-9160 and averaged 972 egg masses per acre. Gypsy moth populations were reduced by approximately 70 percent in this area compared to pre-treatment levels.

Ridenour Overlook and Dam Treatment Areas

The Ridenour Overlook treatment area consists of approximately 90 acres and is located directly west of the Dam. The dam treatment area consists of approximately 72 acres and is located directly south of the dam. Four egg mass survey points were established in the Ridenour Overlook area and 2 survey points in the dam area. Populations in these areas ranged from 0-5920 and averaged 1420 egg masses per acre. Egg mass densities were reduced by approximately 76 percent compared to pre-treatment levels.

Nancy's Camp Treatment Area

The Nancy's Camp treatment area consists of approximately 33 acres and is located along the Allegrrippis Ridge. A total of 4 survey points was established in this area. Egg mass counts ranged from 75-1740 and averaged 587 egg masses per acre. Gypsy Moth populations were reduced by approximately 88 percent compared to pre-treatment levels.

DISCUSSION

The gypsy moth is subject to physical and biological factors that act to regulate population numbers. The effect of availability and suitability of food, site conditions, incidence of natural control factors (predators and parasites), inter- and intra-specific competition, weather effects as well, other influences cannot be predicted at this time.

The results of our egg mass survey indicate that there are sufficient resident gypsy moth populations to cause heavy defoliation in all but the Seven Points treatment area. Due to the geography and gypsy moth population densities in the immediate vicinity however, the Seven Points area does have a high risk of larval blow-in and some degree of defoliation is possible.

The basic data used in this report to estimate the defoliation potential in 1988 includes an evaluation of the past defoliation history of the area in question, the number of egg masses/acre, the size and condition of the egg masses, the available preferred food, the terrain, and the risk of larval blow-in following egg hatch. Potential defoliation is categorized as follows: light (1-30 percent); moderate (31-60 percent); and heavy/severe (61-100 percent).

Although the 1987 treatment apparently provided adequate foliage protection within the spray blocks (see Gypsy Moth Defoliation Survey Report, 9/8/87), the anticipated population reduction (greater than 95 percent) did not occur in any of the treatment areas.

Three management options have been developed and discussed for managing gypsy moth populations at Raystown Lake. These options assume the following objectives: 1) protecting host tree foliage; 2) preventing tree mortality; and, 3) reducing gypsy moth populations. Each is discussed below.

No Treatment Option

It is possible that gypsy moth populations can collapse naturally due to NPV (nucleopolyhedrosis virus), but we are not able to evaluate that likelihood with the information on hand. In any event, it is unlikely that it would happen prior to some degree of defoliation occurring in areas containing more than 250 egg masses per acre. Should light-moderate defoliation occur, only a temporary loss in tree growth and possible larvae nuisance in public areas will occur. Should heavy defoliation occur, however, some branch dieback and tree mortality is likely, depending upon tree condition at the time of defoliation. Trees of the highest risk are those that are presently stressed from other factors, such as: 1) past defoliation; 2) soil compaction due to sidewalks, parking lots, machinery and/or heavy foot travel; 3) over maturity; 4) drought; 5) shock due to recent harvest exposures; and 6) other insect or disease related problems.

Biological Insecticide Option

The only biological insecticide available and approved by EPA for use in the control of gypsy moth is a microbial insecticide based on the bacterium Bacillus thuringiensis variety kurstaki. This insecticide is available by a variety of manufacturers and has been used extensively in State suppression projects throughout the Northeast both in forested and residential areas. B.t. acts specifically against lepidopterous larvae as a stomach poison and must be ingested. The major mode of action is by mid-gut paralysis which occurs soon after feeding. The result is a cessation in feeding and death by starvation. B.t. formulations are available as flowable concentrates, wettable powders, and emulsifiable suspensions. The normal application rates range from 12-20 Billion International Units (BIUs) per acre in each of 1-3 treatments. With proper application, foliage protection and population reductions of about 70 percent can be expected for each application.

Chemical Insecticide Option

Dimilin^R (diflubenzuron) is the most widely used chemical used in State supported suppression programs for the control of gypsy moth populations throughout the northeast. Diflubenzuron is an insect growth regulator that disrupts the normal molting processes of immature larvae. The mode of action is by inhibiting the formation of chitin, a necessary component of the outer cuticle which causes the affected larvae to die during the molt following treatment. The method of uptake is primarily by ingestion, however, recent research has indicated the possibility of absorption through the cuticle as well. Dimilin^R is registered as a Restricted Use Pesticide, but has been approved by EPA for use in residential areas. Dimilin^R is considered extremely toxic to aquatic invertebrates however, and should not be applied to water or wetlands.

Dimilin^R is available as a 25 percent wettable powder formulation, and the recommended application rate is 1-4 ounces per acre applied in one treatment. With proper application, foliage protection and population reduction of about 95 percent can be expected.

Alternatives

With the previously described options in mind, the following 5 alternatives have been developed.

Alternative 1. -- No action.

Alternative 2. -- Single application of Dimilin^R applied aerially at the rate of 2 ounces (formulated material) in 128 ounces of water per acre.

- Alternative 3. -- A single aerial application of B.t. applied at the rate of 12-20 BIUs per acre in 1.0 gallon per acre total mix. An appropriate spreader/sticker should be added at the rate of 2 percent by volume.
- Alternative 4. -- Two aerial applications of B.t. at the same rate as that discussed in Alternative 4. The second application should be applied 7-10 days following the first.
- Alternative 5. -- The application of alternative 2 and a single application of B.t. within the buffer zone applied at the same rate as described in Alternative 3.

RECOMMENDATIONS

Based on the existing gypsy moth populations, and the proximity of the spray blocks to Raystown Lake, the most effective alternatives to implement to provide both foliage protection and population reductions are listed in order of preference as follows:

Alternative 5
Alternative 4
Alternative 2

To a lesser degree of effectiveness, Alternative 3 can be implemented.

Table 1.--Gypsy Moth Egg Mass Survey Results of Raystown Lake, by Plot Number and Survey Location, November 16-18, 1987.

Survey Area	Plot Number	Number of Egg Per Masses/Acre
Seven Points	-1	95
	2	35
	3	640
	4	0
	5	0
	6	0
	7	0
	8	55
	9	135
	10	195
	11	0
Lake Raystown Resort/ Paradise Point	12	0
	13	880
	14	200
	15	560
	16	155
	17	80
	18	1440
	19	3200
	20	255
	21	9160
James Creek Recreation Area	22	9160
	23	1400
Susquehannock	24	735
	25	475
	26	2720
	27	1160
	28	520
	29	360
	30	400
	31	200
	32	0
	33	680
Ridenour Overlook	34	1200
	35	80
	36	5920
	37	75
Nancy's Camp	38	95
	39	435
	40	1740
	41	0
Dam Area	42	635

Table 2.--Summary of Gypsy Moth Egg Mass Data For Each Treatment Area, Raystown Lake, 1987.

Summary			
Survey Area	Plot Number	Egg Per Masses/Acre Average	-Range
Seven Points Recreation Area	1-11, 31, 32	105	0 - 640
Lake Raystown Resort and Paradise Point	12-20	753	0 - 3200
James Creek Recreation Area	21, 22	9160	9160
Susquehannock Campground	23-30	972	360-9160
Ridenour Overlook and Dam Area	33-36, 41, 42	1420	0 - 5920
Nancy's Camp	37-40	587	75 - 1740

Table 3.--Comparison of Pre- and Post-Treatment Egg Mass Counts,
Raystown Lake, 1987.

Treatment Areas	Pre-treatment Average	Egg Mass Count (EM/Acre)		Trend
		Post-treatment Average		
Seven Points Recreation Area	95	105		+ 9%
Lake Raystown Resort and Paradise Point	902	753		-14%
Nancy's Camp	4990	587		-88%
Susquehannock Campground	3274	972		-70%
Ridenour Overlook and Dam	6000	1420		-76%

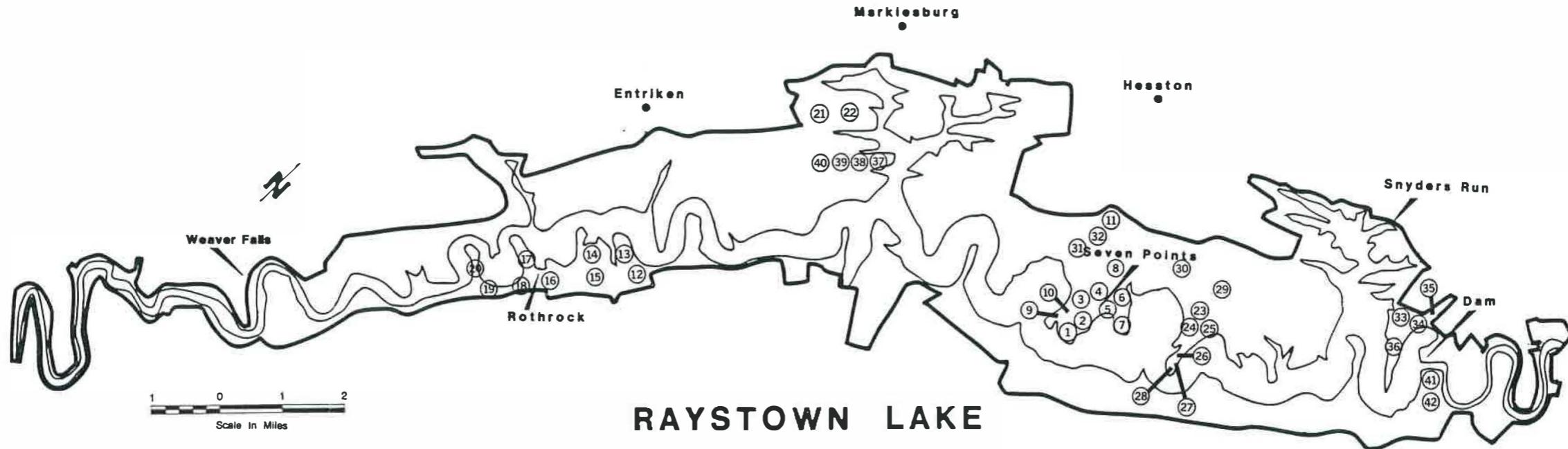


Figure 1. Gypsy Moth Egg Mass Survey
November 16-18, 1987
Plot Locations